



MAGNE-HEAD



MAGNETIC DRUM MEMORY SYSTEMS

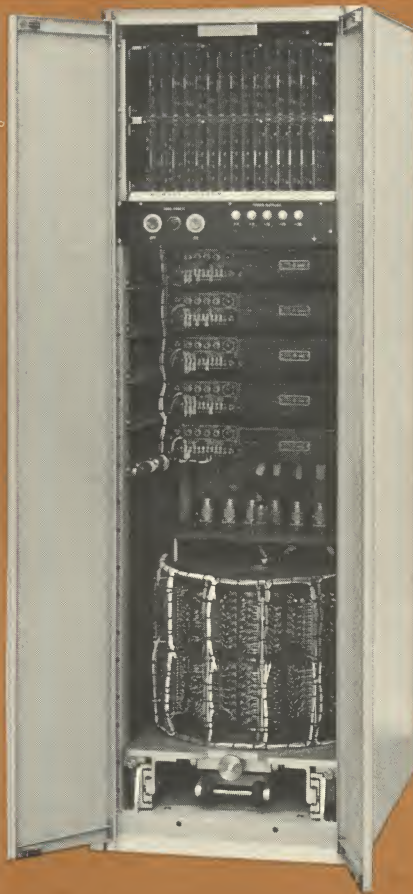
Magne-Head engineers and technicians form a team with the proven capability to design Magnetic Drum Memory Systems which meet the most exacting requirements.

Every Magne-Head project benefits from experience in engineering and producing sophisticated drum memory systems. Accomplishments include memories for military command and control networks, tactical displays, and computer-based communications multiplexing.

Teamwork does it. A single engineering group is responsible for the complete system. The three major system components—heads, drums, and circuits—are designed and manufactured at Magne-Head by specialists in each component area.

Component integration can be costly and time consuming if a memory system is purchased piecemeal. Matching heads to drums and both to circuitry are exacting specialties, *Magne-Head specialties*. Production hardware at Magne-Head is "state of the art" elsewhere. Put these accomplishments and the benefits of single-source responsibility for all components to work for you.

Check your requirements for your complete Magnetic Drum Memory System with Magne-Head.

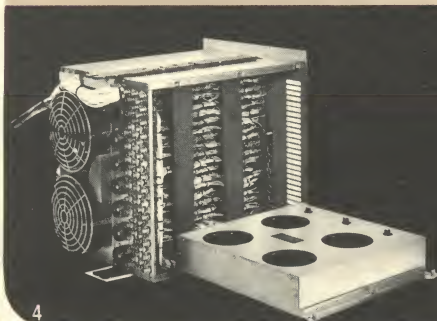


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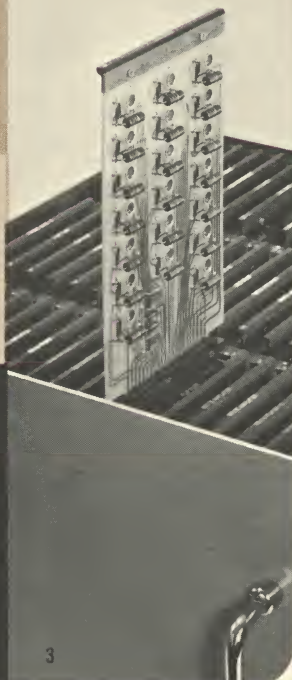
1. Typical memory system for computers, data processors, and communications switching systems.
2. Drum Tester.
3. Logic Boards.
4. Military Memory System



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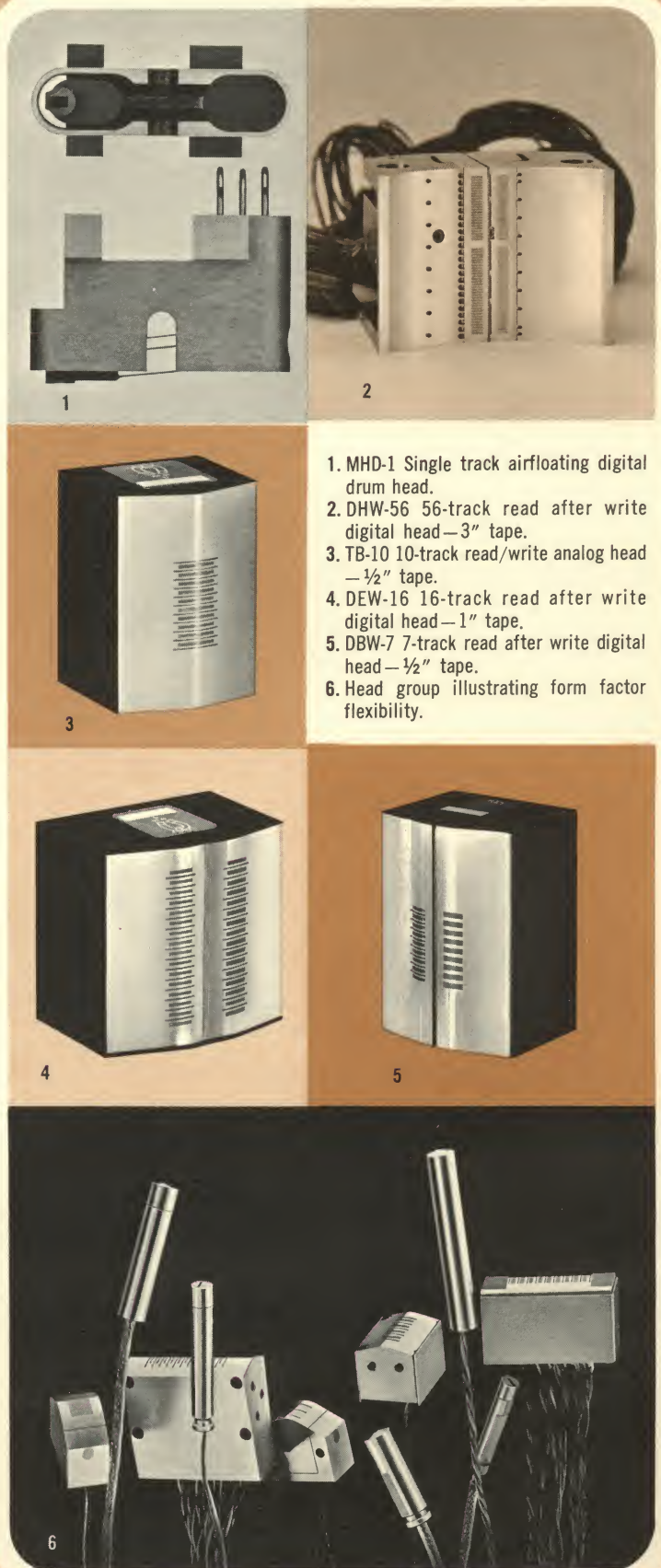
AIR FLOATING DRUM HEADS

Magne-Head manufactures a complete line of air floating record-playback heads. Conservative design, tight manufacturing tolerances, and close surveillance of manufacturing eliminate complicated installation and adjustment procedures. The addition or replacement of heads without stopping the drum cuts installation and adjustment time to a fraction of that required for conventional, non-floating heads. The proximity of the air floating head to the magnetic medium greatly improves record-read efficiency. Record currents are reduced typically by a factor of two. Playback signal is at least tripled over non-floating heads of equivalent inductance and track width. The resulting lower inductance, required for a given application, allows more rapid data transfer into and out of the drum.

MAGNETIC HEADS

Magne-Head is an industry leader in the design and manufacture of magnetic heads for all areas of commercial and military application. Continuing research enables Magne-Head to offer improvements in both performance standards and packaging design. Heads for special purposes, such as magnetic ink character recognition, ledger stripe reading and multiple track magnetic card reading are used in production by many leading equipment manufacturers. Industry standard tape heads are available in the IBM and IRIG track formats for read after write and interlace recording.

Look to Magne-Head. Our engineering people are available to work with you on any magnetic head problem—large or small—from prototype to production.



1. MHD-1 Single track airfloating digital drum head.
2. DHW-56 56-track read after write digital head—3" tape.
3. TB-10 10-track read/write analog head— $\frac{1}{2}$ " tape.
4. DEW-16 16-track read after write digital head—1" tape.
5. DBW-7 7-track read after write digital head— $\frac{1}{2}$ " tape.
6. Head group illustrating form factor flexibility.

**GENERAL INSTRUMENT CORPORATION...
RESEARCH AND MANUFACTURING FACILITIES
LOCATED THROUGHOUT THE UNITED STATES**

Beckley West Virginia	Garden City New York	Mt. Forest Ontario, Canada	Westbury New York
Brooklyn New York	Hawthorne California	Newark New Jersey	Westwood Massachusetts
Chicopee Massachusetts	Hicksville New York (2)	Tazewell Virginia	Woodbury Connecticut
Darlington South Carolina	Joliet Illinois	Waterloo Ontario, Canada	Woonsocket Rhode Island



**MAGNE-HEAD, A DIVISION OF
GENERAL INSTRUMENT CORPORATION**

MAGNETIC MEMORY DRUMS

All magnetic memory drums designed and manufactured by Magne-Head are made of special magnesium alloy, chosen for its strength, light weight and dimensional stability through temperature cycling and aging.

The rotating member is a properly proportioned cylinder with end plates mounted on tapered conical fits. The shaft and end plates are fitted together with slotted cones. There are no press or shrink fits in a Magne-Head drum.

The magnetic medium is hard nickel-cobalt plate which eliminates catastrophic failures due to foreign matter coming in contact with the rotating member, and the dusting and flaking problems inherent with iron oxide coatings.

The shroud assembly is an ultra precision machined portion of the drum with close tolerances which make possible a simple head placement and maintenance procedure.

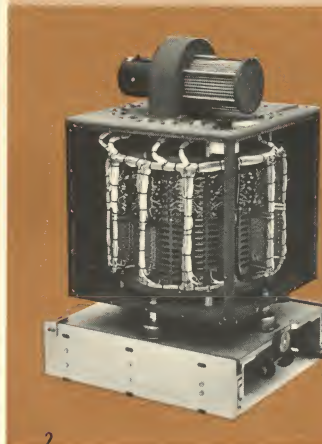
A motor is customized designed for each application and is shaped to fit inside the drum proper, resulting in very efficient use of space.

The Magne-Head drum uses a double squirrel cage rotor in every induction motor. A low reluctance portion of the rotor gives excellent start characteristics; a high reluctance portion contributes to low slip, high efficiency run characteristics.

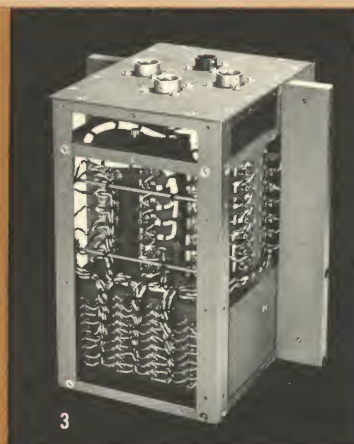
The light weight magnesium drum, coupled with air floating record-play-back heads and metal magnetic coatings make up the most efficient drum package available. This package is almost impervious to temperature shocks, environmental extremes, aging, technician's error, shipping hazards, and the myriad of other problems, inherent with less advanced designs.



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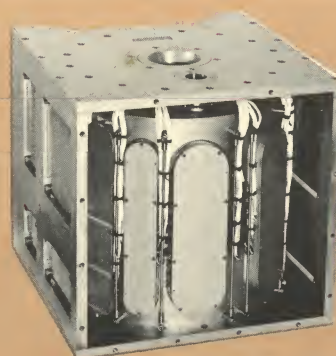
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1. D5000 Drums coupled for 40,000,000 bit capacity as compared to D50 with 200,000 bit capacity.
2. D500 Magnetic Memory Drum.

3. Militarized D50 Magnetic Memory Drum.
4. D500 Hermetically Sealed Militarized Magnetic Memory Drum.



4

MAGNE-HEAD, A DIVISION OF GENERAL INSTRUMENT CORPORATION

Magne-Head is a division of General Instrument Corporation, one of America's largest and most successful electronic companies. As do all divisions of General Instrument, Magne-Head operates autonomously, with the stability and maturity of management characteristic of large corporations. Each division is free to draw on each of the others for their particular specialties. This gives each division a broad platform of capability. The financial strength of General Instrument assures that Magne-Head will be here to finish long term projects.

Activities at Magne-Head cover the whole range of manufacturing from prototype to production. Magne-Head designs and manufactures tape heads, magnetic memory drums and magnetic memory drum systems for aerospace, military and industrial applications. Many of the nation's critical and high priority military and space programs rely on Magne-Head products for both in-flight and ground support applications.

Quality Control at Magne-Head is an independent group reporting directly to Division management.

Military and commercial customer survey teams have approved Magne-Head production and inspection facilities. Plant, people, and procedures meet the exacting standards of major prime military contractors including the Martin Company, General Electric Company, Bunker-Ramo Corp., Nortronics Division of Northrop Corporation, the Lockheed Missiles and Space Company, and International Telephone and Telegraph Corp. Magne-Head is serviced by quality control representatives of both the United States Air Force and Army Ordnance.

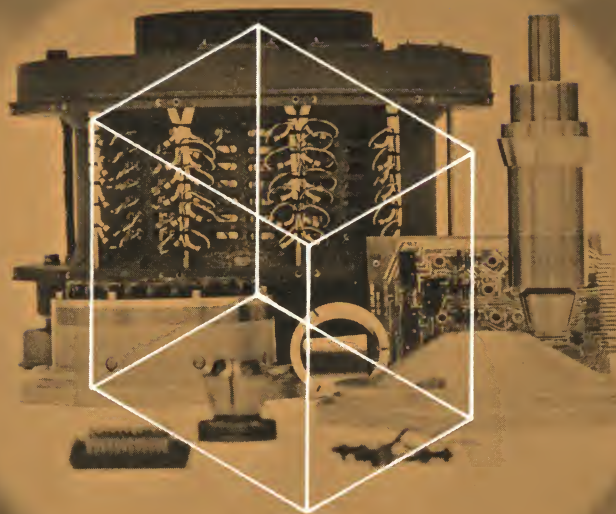
Factory Sales and Application Engineering staffs are available for on-the-spot consultations in the customer's plant. A strong network of representatives is maintained throughout the United States to provide fast, convenient customer service.

Design and production facilities are located in Hawthorne, California, the heart of the aerospace complex near Los Angeles International Airport, and provide convenient customer liaison and the fastest possible delivery of hardware to both the domestic and foreign markets.

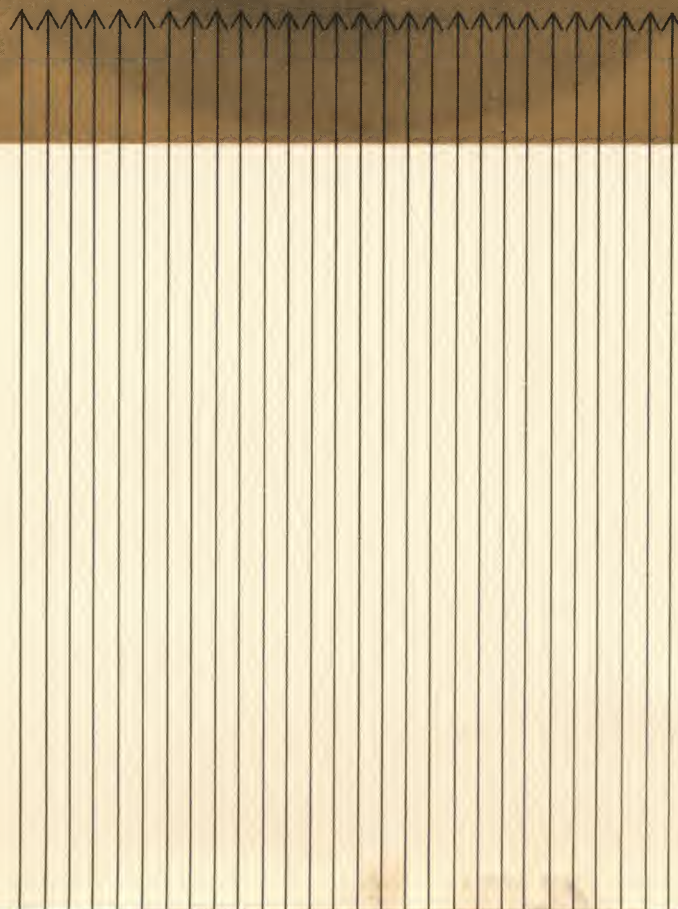


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13040 South Cerise Avenue * Hawthorne, California 90250 * 213 679-3377/772-2351 * TWX910-325-6203



MAGNE-HEAD **DRUM MEMORY SYSTEMS**



TRANSIENT ERROR RATE
<1 BIT IN 10^{12} BITS
SINGLE BIT ALTERATION PHASE
MODULATION RECORDING
<3 MICROSECONDS
WRITE TO READ RECOVERY

These are standard features — not extra - cost “options”
— of Magne-Head magnetic drum memory systems.

LOW ERROR RATE

Reliability is of prime importance in any system. Magne-Head systems must test to a transient error rate of less than one bit in 10^{12} bits. This error rate is achieved with $\pm 5\%$ power supply deviation and with worst case bit patterns applied to 100% of the drum surface.

FLEXIBLE RECORDING TECHNIQUES

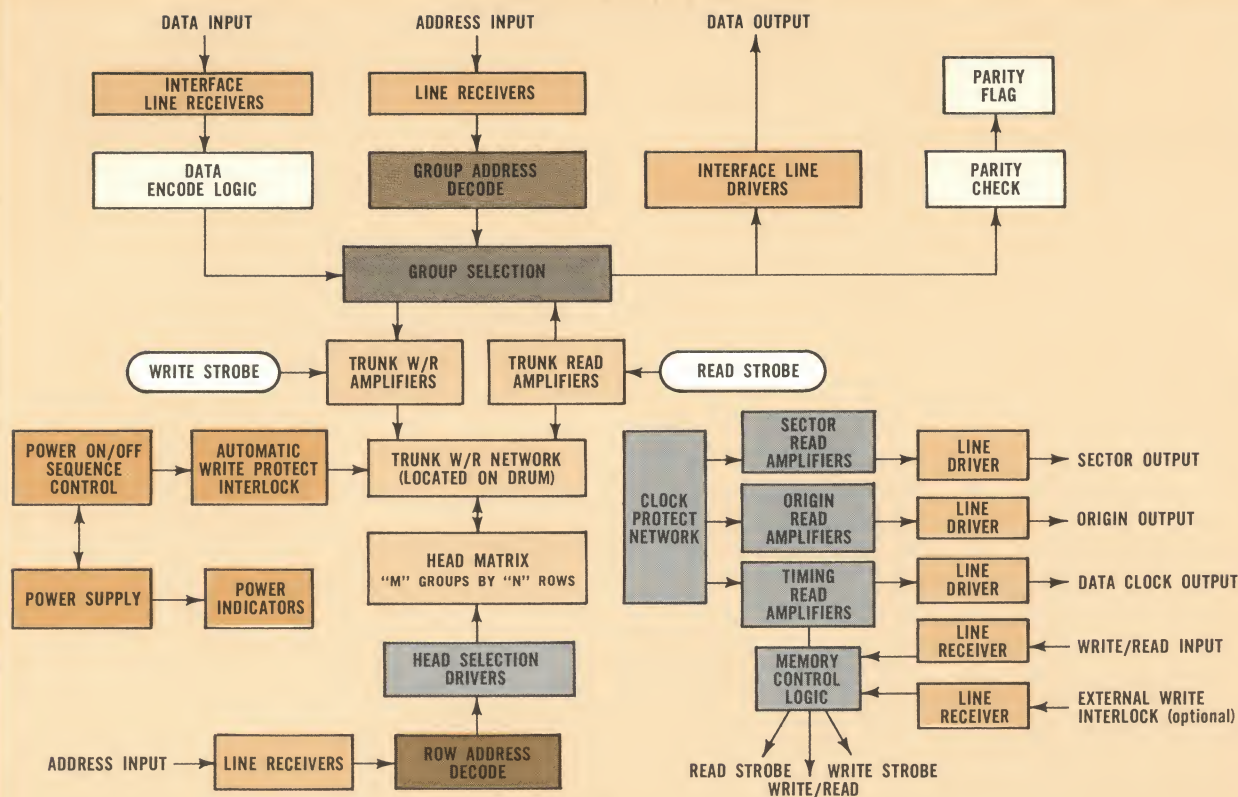
Single bit alteration coupled with phase modulation recording permits reliable operation at high bit transfer rates and packing densities. Development of this technique makes it practical, for example, to record an 8-bit character in parallel at 1 megacycle, packed 600 characters per inch.

FAST RESPONSE

Less than 3 microseconds write-to-read recovery cuts average system access time. With look-ahead programming, it's now possible to read time-adjacent information blocks without waiting for a full drum revolution.

Magne-Head Systems include the interface logic necessary for data exchange between the memory and the data source. Circuit elements accept any digitally coded data and return it on command to its source. This interface versatility minimizes the number of lines necessary to communicate with the memory. For example, less than 30 lines are required to access 16,000,000 bits of information. Standard recording and play-back methods may be implemented with one read-write amplifier design. All magnetic drums in the Magne-Head line — D50, D500, D5000 — are compatible with this design. “Class A Commercial” is the minimum manufacturing standard at Magne-Head. Magne-Head Systems may also be specified to meet the requirements of MIL-E-4158B and MIL-E-4970A. High manufacturing standards pay off in low-cost maintenance, increased system life and years of trouble-free operation. Look to Magne-Head for drum memories. Consult the data; note the wide range of application of Magne-Head systems. Our engineering people look forward to working with you on any system problem: 50 kilocycles to 1 megacycle; 50 kilobits to 100 megabits.





SINGLE BIT ALTERATION AT 500 BITS PER INCH USING PHASE MODULATION RECORDING

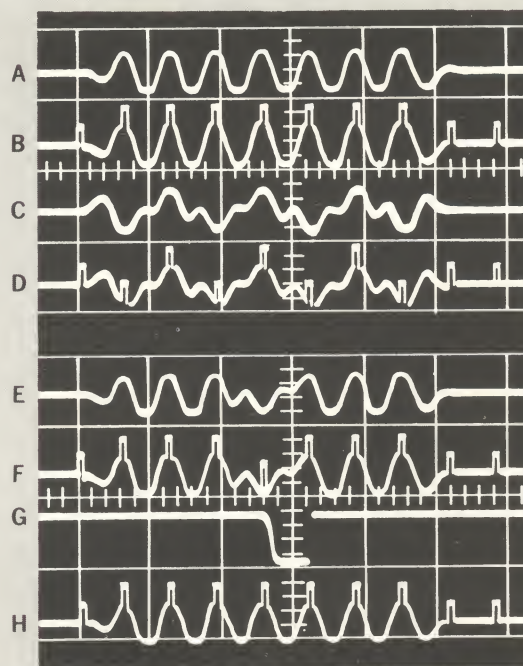
1. The following demonstrates Magne-Head's capability in single bit alteration using Phase Modulation recordings at moderately high packing densities. The example used illustrates 500 bits per inch. The photograph shows that 500 bits per inch is not the limit of the head or coating. This is evident because there is no adjacent pulse shift or attenuation when a bit is removed or inserted. Wave forms were photographed at the output of a standard Magne-Head read amplifier.

2. Oscilloscope Calibration
Sweep 2.0 microseconds/cm
Sensitivity 20.0 volts/cm

3. Drum Specifications

Speed	3600 RPM
Diameter	8 inches
Bits/track	12,560
Bit Packing Density	500 per inch
Flux Reversals	1000 per inch
Clock Frequency Read	743 KC
Clock Frequency Record	1.486 MC

Trace A	A one (1) in each cell.
Trace B	Read strobe superimposed.
Trace C	One (1) - Zero (0) pattern.
Trace D	Read strobe superimposed.
Trace E	Fourth cell modified to a zero (0).
Trace F	Read strobe superimposed.
Trace G	Read amp D.C. restored output.
Trace H	Fourth cell modified to a one (1).



SYSTEMS DATA

Total Storage	50K to 100 million bits
Data Transfer Rate Bit Serial or Bit Parallel	to 1 megacycle
Data Input Requirements	0V and -5 to 20V or 0V and +5 to or +20V
Address and Control Line Input Requirements	0V and -5 to -20V or 0V and or +5 to +20V
Data Input Format	Bit serial, parallel, serial - parallel.
Data Editing	Single bit, single character, block, bit or character interlace.
Clock Output	0V and -5 to -12V
Data Output	or 0V and +5 to +12V
Primary Power Input Any one of the following	120V single phase 60 cps 120/208V 3 phase 60 cps 120V single phase 400 cps 120/208V 3 phase 400 cps
Write to Read Recovery	3 microseconds maximum in an 8 x 64 matrix.
Read to Read and Read to Write Recovery	500 nanoseconds maximum in an 8 x 64 matrix.
Error Rate	<1 in 10 ¹² bits
Access Time	4 to 35 milliseconds average.
Clock protect	to 100V DC
Optional Functions	Memory busy Flag, Parity flag Non destructive power loss. Any frequency primary power.



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